

관상동맥 질환자에서 Nicorandil의 폐동맥 투여 후 혈역학적 변화에 관한 연구

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김명구 · 변정득 · 심규혁 · 온영근 · 현민수 · 권영주

Hemodynamic Effect of Nicorandil into Pulmonary Artery in Coronary Artery Disease

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ABSTRACT

Background and Objectives : Nicorandil has pharmacologic effects similar to nitroglycerin and potassium in respect to the channel opening action in vascular smooth muscle cells. We examined hemodynamic changes in patients following nicorandil infusion. We investigated the action mechanism of nicorandil, and whether nicorandil affects hemodynamic changes in patients receiving antianginal medication. **Subjects and Methods :** A total of 17 patients (11 normal control group, 6 coronary artery disease group) undergoing cardiac catheterization for investigation of chest pain participated in this study. During cardiac catheterization, nicorandil was infused into the pulmonary artery at a dose of 80 μ g/kg over a period of 1 min. Hemodynamic parameters were measured before and at 5, 10 and 20 minutes after nicorandil infusion. **Results :** Five minutes after nicorandil infusion, the maximal changes in preload and afterload hemodynamic parameters were observed in both the coronary artery disease and control group. Changes of preload parameters were sustained longer than those of afterload parameters, and were maintained until 20 minutes after the infusion. Afterload parameters (heart rate and cardiac output), were slowly normalized five minutes after the infusion. In the coronary artery disease group with antianginal medication, additive hemodynamic changes were also seen after the infusion, although the degree of changes were small. **Conclusion :** Following nicorandil infusion, both the preload and afterload hemodynamic parameters decreased, and the preload parameters showed a larger decrease for a longer period than the afterload parameters. In the coronary artery disease group with antianginal medication, additive hemodynamic changes were also seen following nicorandil infusion. (*Korean Circulation J 2001;31(12):1267-1273*)

KEY WORDS : Nicorandil ; Hemodynamics ; Angina pectoris.

서 론

대상 및 방법

Nicorandil(N - 2[hydroxyethyl] nicotinamide ni -
trate) nicotinamide nitrate 대 상
2001 2 2001 7
cyclic GMP 가 pota -
ssium 11 (56.6 ±
1)
9.9 , 3, 8)
2)3)
Nicorandil nitrate 63.0 ± 5.3 , 5, 1) 6 ((Table 1).
4) nitrate sul - nitrate
fhydryl potassium 가 5 , 가 3 , 가 3 .

nitrate 방 법
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nicorandil 가 . nicorandil
nicorandil , , , ,
, nico -
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Nicorandil thod¹¹⁾ . dP/dt
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Cardia Catheterization monitor(SIMENS, Se -
9)10) 가 rial No 01108) program
ni - . Nicorandil
corandil nicorandil(Sigmart®, Chugai, Japan) 80 µg/
kg 1 5 , 10 , 20

Table 1. Clinical characteristics in study groups

	Age (yrs, mean ± SD)	Sex (M/F)	Anti-anginal agent		
			Nitrate	Ca ⁺⁺ blocker	- blocker
CAD	63 ± 5	5/1	5	3	3
Normal	57 ± 10	3/8	0	0	0

CAD : coronary artery disease

통계적 분석

Statistical Package for Social Science(SP -
SS) Paired samples T - test
, p 0.05

Table 2. Changes of preload parameter in control (n=11)

	Before	5 min	10 min	20 min
PCW (m) (mmHg)	8.0 ± 2.5	6.2 ± 2.3 (22.5)*	5.7 ± 2.5 (28.8) ‡	6.0 ± 2.3 (25.0) †
PA (m) (mmHg)	14.1 ± 2.3	11.8 ± 2.0 (16.1) §	12.1 ± 2.2 (14.2) ‡	11.7 ± 2.3 (16.8) §
RV (s) (mmHg)	27.2 ± 4.3	24.6 ± 4.5 (9.4) §	23.2 ± 3.9 (14.7) §	22.3 ± 4.2 (18.1) §
RA (m) (mmHg)	3.8 ± 2.1	2.4 ± 2.0 (38.2)	2.7 ± 1.6 (28.5) †	3.0 ± 1.8 (21.5)*

PCWP, PA and RV were significantly decreased compared to the basal values, and at 5 min, maximal changes were observed. values are mean ± SD (%). * : p 0.05, † : p 0.01, ‡ : p 0.002, § : p 0.001, PCW : pulmonary capillary wedge, PA : pulmonary artery, RV : right ventricle, RA : right atrium, M : mean, S : systolic

결 과

5.6%(p=NS)

6.9%(p=0.02), 8.4%(p=0.03)

가가 (Table 2, 3).

nicorandil 5

가 18.9%(p=0.011), 9.9%(p=0.04), 1.7%(p=NS)

5 22.5%(p=0.012), 7.1%(p=0.01), 7.8%(p=NS)

16.1%(p<0.001), 4.5%(p=NS), 5.9.4%(p<0.001), 9.5%(p=0.002) 7%(p=NS) 가

Table 3. Changes of afterload parameter, cardiac output and vascular resistance in control (n=11)

	Before	5 min	10 min	20 min
LV (s) (mmHg)	125.0± 18.4	118.0± 15.8 (5.6)	116.6± 14.9 (6.8)*	117.3± 19.5 (6.1)
Ao (m) (mmHg)	91.1± 8.6	82.5± 11.4 (9.5)†	83.4± 9.5 (8.5)§	86.8± 11.1 (4.7)
HR (rate/min)	65.1± 8.3	69.6± 10.7 (6.9)*	65.2± 9.5 (-0.1)	64.7± 8.4 (0.6)
COP (L/min)	4.8± 1.1	5.2± 1.3 (8.4)*	5.0± 1.2 (4.2)*	4.6± 1.0 (-3.0)
CI (L/min/m ²)	2.9± 0.5	3.1± 0.7 (9.0)*	3.0± 0.6 (4.5)*	2.8± 0.5 (-2.4)
dP/dt (mmHg/sec)	1443.8± 326.0	1468.8± 342.5 (1.7)	1456.3± 310.4 (0.9)	1531.3± 196.1 (6.1)
SVR (dyne · sec · cm ⁻⁵)	1559.3± 485.5	1343.6± 481.9 (13.8)†	1400.5± 498.8 (10.2)§	1539.7± 489.6 (1.3)
PVR (dyne · sec · cm ⁻⁵)	106.6± 42.8	92.6± 46.7 (13.1)	107.3± 54.7 (-0.7)	102.4± 55.6 (3.9)

Ao, HR, COP were significantly decreased compared to the basal values, and at 5 min, maximal changes were observed. Values are mean±SD (%). *: p 0.05, †: p 0.002, §: p 0.001, LV: left ventricle, Ao: aorta, HR: heart rate, COP: cardiac output, CI: cardiac index, SVR: systemic vascular resistance, PVR: pulmonary vascular resistance, M: mean, S: systolic

Table 4. Changes of preload parameter in coronary artery disease (n=6)

	Before	5 min	10 min	20 min
PCW (m) (mmHg)	10.6±3.5	8.6±3.3 (18.9)*	8.6±3.5 (18.9)*	8.6±2.9 (18.9)*
PA (m) (mmHg)	18.5±4.8	16.7±3.6 (9.9)*	15.7±3.1 (15.3)*	16.0±3.3 (13.5)
RV (s) (mmHg)	29.5±7.0	29.0±4.0 (1.7)	28.2±5.6 (4.5)	28.7±4.7 (2.8)
RA (m) (mmHg)	5.8±2.5	5.2±2.2 (11.3)*	4.8±2.1 (17.2)*	4.7±2.2 (20.0)*

PCW, PA, RA were significantly decreased compared to the basal values, and at 5 min, maximal changes were observed. Values are means±SD (%). *: p 0.05, PCW: pulmonary capillary wedge, PA: pulmonary artery, RV: right ventricle, RA: right atrium, M: mean, S: systolic

Table 5. Changes of afterload parameter, cardiac output and vascular resistance in coronary artery disease (n=6)

	Before	5 min	10 min	20 min
LV (s) (mmHg)	126.0± 38.9	116.2± 25.1 (7.8)	113.8± 23.1 (9.7)	118.0± 21.4 (6.4)
Ao (m) (mmHg)	91.0± 22.6	84.5± 19.8 (7.1)†	85.5± 19.7 (6.0)†	87.3± 18.9 (4.0)
HR (rate/min)	59.8± 9.3	62.5± 7.6 (4.5)	59.5± 7.7 (0.6)	59.2± 7.1 (1.1)
COP (L/min)	4.6± 0.4	4.8± 0.6 (5.7)	4.6± 0.4 (1.8)	4.3± 0.3 (-4.8)
CI (L/min/m ²)	2.7± 0.2	2.8± 0.3 (5.7)	2.7± 0.2 (1.9)	2.5± 0.2 (-4.9)
dP/dt (mmHg/sec)	1177.5± 410.2	1050.0± 342.3 (10.8)	1135.0± 375.4 (3.6)	1200.0± 221.4 (-1.9)
SVR (dyne · sec · cm ⁻⁵)	1421.9± 299.3	1267.1± 258.6 (10.9)	1327.3± 261.4 (6.7)*	1484.0± 301.5 (-4.4)
PVR (dyne · sec · cm ⁻⁵)	113.0± 21.6	120.5± 23.6 (-6.7)	106.4± 35.4 (5.9)	132.2± 33.0 (17.0)

Ao was significantly decreased compared to the basal values, but LV, HR, COP were not significantly. Values are means±SD (%). *: p 0.05, †: p 0.01, LV: left ventricle, Ao: aorta, HR: heart rate, COP: cardiac output, CI: cardiac index, SVR: systemic vascular resistance, PVR: pulmonary vascular resistance, M: mean, S: systolic

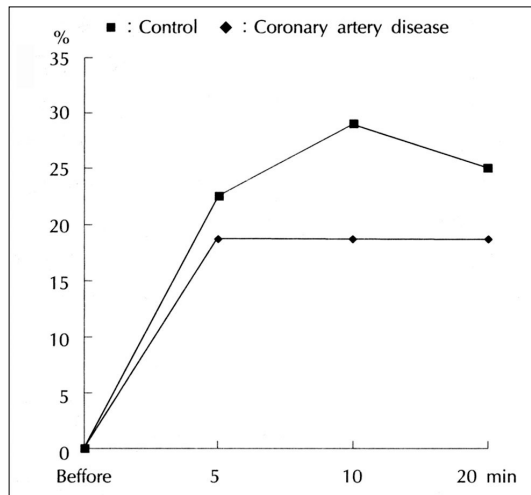


Fig. 1. Serial changes of pulmonary capillary wedge pressure. At five minute after nicorandil infusion, maximal change was observed in both the coronary artery disease and control group. There was not significant difference in both group, but showed a larger change in control group. This change was maintained until 20 minute.

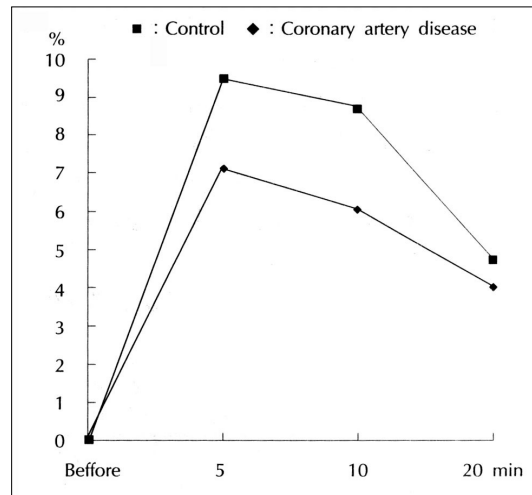


Fig. 3. Serial changes of aortic pressure. At five minute after nicorandil infusion, maximal change was observed. There were not significant differences in both group, but showed a larger change in control group. This change was slowly normalized 5 minute after nicorandil infusion.

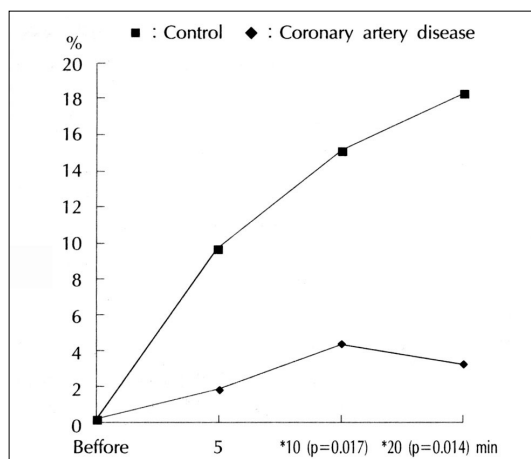


Fig. 2. Serial changes of systolic right ventricular pressure. Systolic right ventricular pressure change was maintained until 20 minute in control group, but slowly normalized 20 minute in coronary artery disease group. Significant differences in both group were showed at 10 ($p=0.017$) and 20 ($p=0.014$) minute.

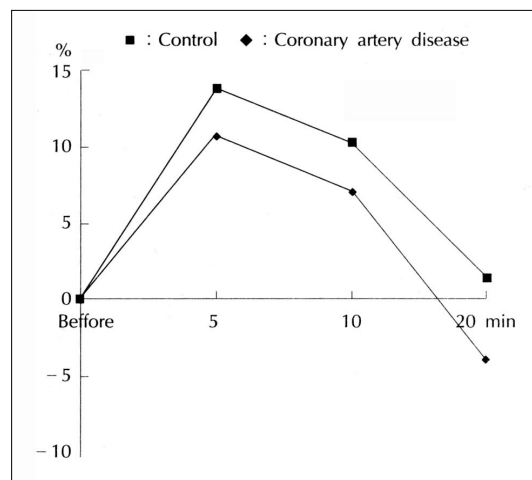


Fig. 4. Serial changes of systemic vascular resistance. Five minute after nicorandil infusion, maximal change was observed. There were not significant differences in both group, but showed a larger change in control group. This change was slowly normalized 5 minute after nicorandil infusion.

(Table 4, 5).

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(Fig. 1 - 4).

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고 찰

nicorandil

nicotinamide

5) Murakami 14) nicorandil

1-3) Nicorandil N - 0.1 mg/kg 0.2 mg/kg

[2 - hydroxyethyl] nicotinamide nitrate 0.2 mg/kg

cyclic GMP 가 ni - 가 Coltart 6)

trate nicorandil

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4)12) prostaglandin Nicorandil 가 15)

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nicorandil (free 1 Utoh 10) nicorandil

radical) 4) Coltart 6) nicorandil

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nitrate 가 Murakami

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nitrate nicorandil Nicorandil nitrate

Kato¹⁾ , , , 16) Murakami 14) Minamiji

nicorandil mg nicorandil 4~8 mg nitro -

7 meta - analysis nicorandil glycerin Belz 17) ni -

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8~18%, 8~27% 가 가

Kato¹⁾ Aizawa 18)

Tsutamoto 19) nicorandil

Nicorandil nicorandil nicorandil SH

potassium

Nicorandil 5 가

nicorandil 가

요 약

배경 및 목적 :
Nicorandil nitroglycerin
potassium

nicorandil

nicorandil

nicorandil 가

방 법 :

11 ()
6 ()

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80 µg/kg nicorandil 1
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결 과 :

nicorandil 5

가 ,

가

20

5

nicorandil 가

결 론 :
Nicorandil

nicorandil 가

중심 단어 : Nicorandil ; ;

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